Space Weather Forecast

Issued on Monday, 20 May 2024 at 12:12 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of isolated Moderate-class flares throughout. Chance of G1-G2 (Minor/Moderate) Storm conditions Days 1-3 (from 20th to 22nd May).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Moderate, the strongest flare being a Moderate-class event that occurred at 19/1756 UTC from the moderately large region in the southeast. A Low-class flare occurred at 20/0554 UTC from a relatively small region in the southwest.

There are currently seven sunspot regions on the visible disc. The largest region remains in the southeast. It comprises of a number of large, mature spots, with recent consolidation of some of the smaller spots. This region did consist of a small delta spot, which has now faded. The next largest region is in the southwest and has been the source of some low-level C-class activity. Although the main lead and trailer regions are well-separated there are a number of small pores or spots of mixed polarity occupying the intermediate portion of the group. The region responsible for the latest Low-class flare indicates modest magnetic complexity, with numerous small trailing spots and some consolidation. The other sunspot regions are generally smaller, simpler and generally stable.

A large filament (arc of plasma) lift-off from the southern hemisphere that began around 18/2200UTC has been modelled as missing below Earth orbit. Another large filament eruption observed after the Low-class flare that occurred at 20/0554 UTC from the region in the southwest. We are currently awaiting the results of the analysis but given its location and early imagery, it is likely to have an Earth-directed component. Otherwise, no Earth-directed CMEs were observed in the past 24 hours.

Solar Wind / Geomagnetic Activity:
Solar winds were indicative of a near background regime, though perhaps with minor positive coronal hole influence. Solar wind speeds have ranged between 340-410km/s. The Interplanetary Magnetic Field (IMF) was in between weak and moderate, around 8nT. The all-important north-south component was stable and fluctuating slowly between positive and negative values. Geomagnetic activity was at Quiet to Unsettled levels (Kp1-3).

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) remained below the S1/Minor Radiation Storm levels and are now at normal background levels.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate activity is expected with a chance of isolated Moderate-class flares and a very slight chance of isolated Strong flares. The moderately sized sunspot region in the southeast disc is most likely to be the source of significant flare activity.

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Solar Wind / Geomagnetic Activity: There is the chance of a glancing blow from a CME at Earth late day 1 (20 May) or perhaps early day 2 (21 May), resulting from the M7.2 flare that occurred late on 17 May from the large sunspot region in the southeast. We are also awaiting the results of the analysis from the halo CME that occurred earlier today (20/05:54 UTC) but there is potential for Earth to take another glancing blow on Day 3 (22nd). In the meantime, solar winds are forecast to remain at or near background speeds, with no significant coronal hole enhancements expected.

Quiet to Unsettled conditions initially, before a possible glancing blow from a CME (which left the Sun on 17 May) arrives at Earth late day 1 (20th) or early day 2 (21st) with a chance of Active to G1-G2/Minor-Moderate (Kp5-6) intervals. Another chance of G1-G2/Minor-Moderate Storm is possible at the end of Day 2 (21st) and on Day 3 (22nd), under the influence of the halo CME. Activity should then subside towards Quiet to Unsettled levels by Day 4 (23rd).

Aurora Forecast: Two significant enhancements to the auroral oval are expected tonight (20-21 May) and tomorrow (21-22 May), following the forecast potential arrival of two different CMEs. Should the CME be detected at Earth, aurora may become visible (where skies are clear) across parts of Scotland and Northern Ireland, with a slight chance that views of the aurora may also be possible from northern England and North Wales. The chance of enhanced aurora activity is expected to decline again on subsequent nights.

Energetic Particles / Solar Radiation: Solar radiation is below the S1/Minor Storm threshold, on a slightly declining trend, but remains just above normal background levels following flare activity from the past week. There is a persistent slight chance of further enhancements should any large flares occur.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	50	50	50	1
Strong	G3	No	10	10	10	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	60	60	60	60
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	10	10	10
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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